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ABSTRACT

Significant change in curriculum also affects other facets of schooling, including teaching, learning, and the school culture. The Curriculum Reform Project explored the nature of various curricular reforms, the barriers to reform, and the means by which selected schools met challenges and achieved positive change. The 4-year research project focused on science education, mathematics education, and higher order thinking across the disciplines. This volume, the last in a series of three, describes the study's research design and methodology, including sample selection, data collection, and data analysis. Methodology entailed nine case studies of middle and senior high schools engaged in educational reform--three in science education, three in mathematics, and three in higher order thinking across the curriculum. Individual school sites were selected on the basis of five criteria: a focus on enabling all students to learn to think, a constructivist approach to learning, a "less-is-more" perspective on curriculum, the integration of knowledge across disciplines, and the concept of students as active learners. Data were primarily gathered through classroom observations; interviews with students, teachers, administrators, and other key personnel; and school-site documents. Two tables are included and references accompany each school profile. (LMI)

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FINAL TECHNICAL RESEARCH REPORT:

STUDY OF CURRICULUM REFORM

VOLUME III: TECHNICAL APPENDIX---RESEARCH DESIGN AND METHODOLOGY

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University of Colorado

Boulder, Colorado

August 31, 1995

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A. PREFACE

As the educational reform efforts of the eighties carried on into the nineties, the Office of Educational Research and Improvement launched a program of research studies which addressed various facets of educational reform. The research reported here is the result of one of 12 such studies initiated by that Office in 1991.

The focus of this four-year research project has been curriculum reform, with specific attention to the three areas of science education, mathematics education, and higher order thinking across the disciplines.

Significant curriculum change is more than a curricular matter; it extends into most other facets of schooling, including teaching, learning and the culture of the school. Major change demands the attention of parents as well as the full range of school personnel.

As past research--and this study--shows, educational reform is an ongoing process and seemingly never complete. It requires a major commitment over a long period of time. This study tells this story in considerable detail, including the nature of various reforms, the barriers to reform encountered, and the means by which challenges were met and positive change achieved.

The report of this research is contained in three volumes: I. Findings and Conclusions, II. Case Studies, and III. Technical Appendix: Research Design and Methodology. This volume (III) contains a description of the research design and various facets of the research methodology, including sample selection, data collection and data analysis. For a full report of the cross-site analysis of the case studies see volume I. The reader wishing to read the case studies in their entirety is referred to volume II.

This report is presented with the expectation that it will be helpful to others pursuing educational reform, whether they be policy-makers, practitioners, parents or researchers. With it go best wishes to all in the quest for improved education.

Ronald D. Anderson
Boulder, Colorado
June 1995

B. ACKNOWLEDGEMENTS

A four-year project of this size requires the participation and support of many people. A debt of gratitude is owed to many people including those acknowledged below.

The first acknowledgement is to Mary Ann Varanka-Martin who served as associate director of the project during its first two years and returned to help at some key points in the project's final stages. She played the major role in organizing a national conference held in 1992, and managed much of the process of identifying study sites and gaining access to them.

Major investments of time were made by the staff researchers who conducted the case studies, including Kathleen Davis, Maurene D. Flory, Elizabeth Meador, Beverly Anderson Parsons, Stephanie Quate, Lew Romagnano, Erin Rosen and Joan M. Whitworth. Each person had a particular site to study, requiring several weeks on site in the assigned school and, of course, a long time "on the road." Analysis and writing was considerably more time-consuming. In addition to their impressive professional competence, their dedication and positive outlooks created a great collaborative working context.

In addition to conducting their individual case studies, Beverly Anderson Parsons and Lew Romagnano each provided leadership for one of the three components of the study--Beverly Anderson Parsons for thinking across the disciplines and Lew Romagnano for mathematics education. Their intellectual leadership was of great importance to the project. (Leadership for the science education component was provided by the project director, who also conducted one of the nine case studies.)

Hundreds of students, teachers, administrators, parents and other personnel connected with the schools we studied welcomed us, graciously shared with us their time and insights, and were patient with our quest for understanding. Memories of our time with people in these schools are pleasant indeed.

The many people who nominated educational reform sites for our consideration--and the personnel in these sites who provided further information for us--were important to our work. Their help is appreciated.

Our project's program officer at OERI, Judith Segal, played an influential role in shaping the project. Her reviews of our work were always insightful and helpful and she made the relationship between research group and funding agency positive and productive.

Our advisory group shared many valuable insights with us. Not being part of the working staff, however, they cannot be held responsible for what we did with their advice. They include:

Bill G. Aldridge, National Science Teachers Association
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Penelope L. Peterson, Michigan State University

Thomas A. Romberg, University of Wisconsin
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Ivette Torres, National Education Association

Margaret Eisenhart, a colleague at the University of Colorado, also served as an advisor to the project. Her insights and understanding of qualitative research made substantial contributions to our work.

Zaretta Hammond is to be commended for her editing skills and dedication to giving a diverse set of case studies some commonality in mode of presentation.

Other personnel at the University of Colorado, including secretaries Linda Webster and Bernice Moon, administrative assistants Patty MacDonald and Sue Middleton, Associate Dean Marc Swadener, and Dean Philip DiStefano each supported the project in important ways. Their support is most appreciated.

Many thanks to all.

Ronald D. Anderson
Project Director

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E. RESEARCH DESIGN

[NOTE: Some of the information in this section and the following one also is included in Volume I.]

The central goal of this research was to conduct case studies of schools--or a department within a school--which were engaged in curriculum reform. These sites were to be ordinary school settings in the sense that they were not dependent upon large infusions of new funds or the intellectual resources of experts devoting large amounts of time to the site. They obviously could be under the influence of outside support in the form of funds and expertise, but the amount of such support would be within bounds most schools could plausibly encounter through rather routine federal or state programs of support for educational change.

A research plan was developed as the foundation for this set of nine case studies--three each in mathematics, science and thinking across the disciplines--to be conducted during the 1992-93 and 1993-94 school years.

The Research Questions

Among the prominent research questions are ones pertaining both to the substance of the reforms and the means by which the reforms were put in place. The substance of the reforms includes attention to both the content of the curriculum and the instruction by which students acquire it. The means by which the reforms are put in place includes particular attention to systems thinking and the overall patterns of reform activities.

The substance of reform. The following questions are among those addressed with respect to the curriculum reforms themselves.

1. How are the sites defining their purposes and goals of reform with respect to students, teachers and the rest of the system?

2. What changes have occurred in the *content* of instruction?

3. What changes have occurred in the *means* of instruction, i.e., how are teachers fostering students' ability to construct desired learning outcomes?

4. What has been the impact on student learning and what can be inferred from positive results about various ways of teaching science, mathematics, and higher order thinking?

5. How "deep' are the changes; i.e, have the beliefs of students, parents and teachers changed?

6. To what extent and how is the *learning* and *teaching* of thinking skills being transferred across disciplines?

The means of reform. Attention also is directed to how people got to where they are. This investigation includes looking for patterns of support throughout the system and examining how people monitor their progress toward desired goals.

1. What are the mechanisms for change?

2. How do implementation efforts play out in classrooms; i.e. what happens in classrooms when teachers embrace the spirit of the reforms espoused by the various national groups?

3. How are sites developing high quality content that meets the needs of their full range of students?

4. How are sites developing teachers' abilities to use a constructivist way of teaching?

5. What are the dynamics of change as viewed from a teaching and learning perspective among (a) students, (b) teachers and (c) the rest of the system?

6. How are sites working out the trade-offs related to financial and expertise resources?

7. To what extent has the process of reform been top-down, bottom-up, or some combination of the two?

8. What are the means of system support? To what extent and in what ways are the system support strategies congruent with a constructivist view of teaching and learning?

9. To what extent does the approach to change at the sites reflect systems thinking?

Conceptual Framework

Fully understanding a complex and dynamic situation requires examining it from a variety of perspectives. Looking at it from a variety of vantage points provides a fullness of understanding not possible when seen during a limited time span, through the eyes of only selected categories of participants, or from the standpoint of selected interactions within the total dynamic setting.

Many perspectives are built into the conceptual framework to ensure that field observations and interviews acquire data needed for a wide range of analyses. Coherent portrayals of the situation in each school later will require a limited number of analyses, but at the beginning a fairly broad set of perspectives is demanded, as described below.

Time perspective. The conceptual framework for this research is based on looking at a "slice" of the present (portions of one academic year) to understand (1) the past from which it came, (2) the present (in terms of influences, results and dilemmas), and (3) the perceptions of future

destinations held by the various people involved. As a result the research questions stated above must be expanded upon to give a form such as the following.

- What are the *past* patterns of school practice from which the current practices emerged?
- What is the nature of *current* school practice?
- What is the *future* which the various actors envision as their intended destination?

Influences, results and dilemmas. To understand more of how changes over time have and are occurring, it is necessary to examine the dynamics of the situation including the following.

- What influences (e.g., pressures, supports or barriers) have affected these reforms?
- What have been the results of these reforms?
- What dilemmas have arisen for the various actors in these reform efforts?

Multiple dimensions. These questions about influences, results and dilemmas encompass at least the following four dimensions:

- ***Personal***: influences based in the knowledge and beliefs of the individual actors involved in the reform effort as these beliefs and knowledge relate to such matters as the discipline, teaching, learning, school and students.
- ***Interactional***: influences based in the interactions of people in classrooms or other settings.
- ***Contextual***: influences arising in the social, cultural, structural, organizational, political, or historical context.
- ***Historical***: influences arising from past events and their resultant structures, patterns of interaction, and convictions of people.

Interest group perspectives. What are the perspectives of the following at each site and how do they compare: students, teachers, administrators, policymakers, and parents? How does the reform as defined at each site map onto reform ideas as defined by (1) professional groups at all levels, and (2) the public in general?

Systems thinking. How can a systems approach to analyzing these reforms help in understanding the changes?

Subject-matter perspective. Because of the importance of subject-matter considerations within this research, the research questions must be explored from both discipline and non-discipline specific perspectives.

Critical components. the following guides to observation, questioning and analysis will be used:

- ***Student goals and expectations*** as exhibited in intended and actual learning outcomes,
- ***Teacher professionalism*** as reflected in professional development activities and participation in professional work such as curriculum development.
- ***Vision*** as indicated by changes in school curricula or pedagogical practices, school routines or daily operations, and statements of vision.
- ***Curriculum, instruction and assessment design*** including the degree of complementarity of these three.
- ***Changing roles*** of students, teachers, administrators and parents, with attention to their responsibilities and the interrelationships of these roles.
- ***Resource allocation***, including both financial allocations and the expenditure of professional time.
- ***Means of expanding the reform*** to additional individuals and groups, or portions of the curriculum.

Research Context

This research was pursued in the context of nine schools selected because they were successfully moving toward reformed education and were ordinary schools, not special settings with unusual resources.

F. METHODOLOGY

This research employed a case study methodology using various qualitative techniques. The following sections include a description of the site selection, data collection, and data analysis.

Site Selection

The site selection process identified programs in nine schools, three each in mathematics, science and thinking skills across disciplines, and negotiated access to them for conducting case studies of curriculum reform. Because of a temporary interruption in the contract funding due to congressional appropriations process, the site selection process actually took place in two parts for two different academic years. The nature of each search and its associated criteria are presented below.

Initial site selection. The initial selection process involved a lengthy and intensive search which identified multiple sites for all three subject areas, based on several specific criteria.

Selection criteria. Based on a review of the research literature on curricular reform in science, mathematics and thinking across disciplines, individual school sites were sought having the following, non-prioritized five characteristics:

1. Enabling *all students* to learn to think is an educational goal.

2. An important theme is a so-called constructivist approach to learning.

3. A related theme regarding the curriculum goes under the label: "less is more".

4. Instead of the presentation of isolated facts, major attempts are made to focus on major themes of the subject matter and foster an integration of knowledge across disciplines.

5. Constructivist learning requires constructivist approaches to teaching; rather than viewing students as passive recipients of information, teachers must focus on helping students construct understanding of concepts for themselves.

Schools having several of these reform characteristics in place, and having evidence of positive outcomes for students were considered as case study sites.

The search process. The search process consisted of two phases--a nomination phase and a contact/information-gathering phase.

Nominations. The search process began with the solicitation of nominations from researchers and knowledgeable practitioners across the U.S. For example, approximately 400 of the leading science education researchers were contacted at a general session of the annual convention of

the National Association for Research in Science Education and given written nomination forms. A similar approach was used at a meeting of researchers at a conference of the National Council of Teachers of Mathematics. Letters were sent to leading scholars familiar with higher thinking skills programs in schools.

In addition specialized contacts in some areas were employed. In science, the leaders of the two major reform movements--the National Science Teachers Association (NSTA) Scope, Sequence and Coordination (SS&C) Project and the American Association for the Advancement of Science's (AAAS) Project 2061--were asked for suggestions of schools where these reforms were in place and underway. Several SS&C sites were proposed but Project 2061 leaders did not believe any of their sites were not sufficiently operative to qualify for the study at that time. Major curriculum development organizations were asked to suggest sites as were members of the Curriculum Reform Project Advisory Group. The selection of mathematics sites also involved nominations from Woodrow Wilson Foundation mathematics participants and instructors.

Contact/information. Most nominations were followed up with telephone conversations with the nominators. Based on these discussions, decisions were made as to which nominations were worthy of follow-up by direct contact with the schools. Key people at the nominated schools were then contacted by phone to get additional information. Written exchange of information followed. Information sought from sites included indicators of student learning outcomes. After sites were identified and preliminary contact made, a list of the sites was forwarded to OERI for approval.

Geographical location. The search process was directed at sites across the U.S. with no selection criteria regarding geographic location. The nine sites are located in seven different states, widely distributed across the country.

First round sites

Thinking across disciplines. School in a suburban district in the western U.S.

- 9-12 high school
- 1350 students with about 20% minority population
- middle to lower class socio-economic status
- been in operation 4 years (at time the site was proposed for inclusion)
- focus on students in core curriculum taken by all 10th grade students
- core curriculum integrates science, social studies, English and some other subjects
- 21 teachers involved in the core
- entire school attempting to emphasize active involvement of students in learning, team teaching and higher order thinking

Mathematics. School in a suburban district in the western U.S.

- new suburban high school
- initiative for reform has come from the mathematics faculty of the school
- beginning third year of operating a 3-year integrated mathematics program -- Interactive Mathematics Program (IMP) developed at Lawrence Hall of Science and San Francisco University
- also operate a traditional mathematics program and have comparative data

Science. School in a suburban district outside a large California city

- a Scope, Sequence and Coordination Project (NSTA) school
- program is tied to the California "State Framework"
- faculty includes leaders in developing science reform in the state
- teaching coordinated science--a three year integrated science curriculum

Second round site selection. In round two, six additional case studies were initiated. Information and understanding developed in conducting the first three studies informed a new round of site selection criteria. Several schools considered in the first round were not considered during the second round of site selection for several reasons: lack of interest on the part of the school to participate at this later date, turn-over of administration with whom access had initially been negotiated, and similarities between sites already studied and those remaining to be studied. When additional criteria were added to broaden the generalizability of the group of case studies and the cross-site analysis, others of the remaining six original sites were eliminated from consideration.

The additional search process. The additional search process again consisted of two phases--nominations and contact/information- gathering.

Nominations. The solicitation of additional site nominations for case studies was conducted through a letter campaign to selected resource people whose knowledge of the particular curricular area and schools was considered to be outstanding. Follow-up phones calls were made to all the sources.

Contact/information. Individual contact people at the nominated schools were contacted by telephone to ascertain the school's program in the area of interest--thinking skills, mathematics, or science--student demographics, and school reform characteristics. The contact person then sent descriptive information about the program and available data about student learning to the Curriculum Reform Project.

Second round sites.

Thinking across disciplines. School in a suburban district on the West Coast

- 6-8 middle school
- 1200 student with about 56% minority students (46% Hispanic, 8% African-American, 2% other)
- two years using High Success Network's Transformational Outcome-Based Education measured by student achievement of locally defined exit outcomes
- thinking skills program centered around Universal Dimensions or Spheres of Living
- exit outcomes were related to world of work, community and family

School in an urban district in the Southeast

- 9-12 high school
- 1200 students with 27% African-American students
- 7 years of restructuring, 5 years affiliation with Coalition of Essential Schools
- focus of study is locally developed 11th grade two-hour interdisciplinary course in history/English

Mathematics. School in an urban district in the northwest

- 9-12 high school
- 1600 students with 25% Hispanic students
- long history of math reform paralleling national trends
- reform driven by individual teachers using existing materials available commercially--i.e., The North Carolina Materials, The University of Chicago School Math Program, and one program, The Integrated Science-Math Course, developed in-house

School in an urban district in the Midwest

- 9-12 high school
- 1700 students with largest minority population Native American
- middle to lower-middle class
- reform predicated on a State Systemic Initiative grant
- teachers active in various aspects of SSI reform over three years--writing, piloting, using, assessing curriculum and teacher training

Science. School in a district straddling urban, suburban and rural boundaries along East Coast

- 6-8 middle school
- 50% minority student population

- reform involves implementaton of a state developed Scope Sequence and Coordination program
- site-based management contributed to school's participation
- reform in existence for 2 years

School in a district serving a military base, rural agricultural area and small city in the Midwest

- 6-8 middle school
- 700 students with 38% African-American, 9% Hispanic, 5% Asian-American or Pacific Islander and 1% American Indian or Alaskan Native
- reform district initiated implementation of commercial program developed by an NSF-funded curriculum project
- reform in effect 2 years

A comparison of these schools for length of time in reform and source/impetus for reform is given in the table 1 below. A comparison of all nine sites for grade level impacted, geographic area, type of district--rural, suburban or urban, minority population and socio-economic status of the community--appears in table 2 below.

Table 1. Comparison of All Sites for Length of Reform Operation and Source of Reform

Subject Area	Time of Reform Operation	Developer of Reform
Thinking skills	5 years	Teachers in the school
Thinking skills 2	2 years	Commercial enterprise
Thinking skills 3	7 years	Local teachers
Mathematics 1	4 years	National developer
Mathematics 2	7 years	Commerical textbooks and Teacher development
Mathematics 3	3 years	State Systemic Initiative
Science 1	3 years	Local teachers in a state and national context
Science 2	2 years	State developed SS&C
Science 3	2 years	District initiated use of commerical program

Table 2. Comparison of Nine Sites for Several Geographic and Social Considerations.

Subject	Grades	Geographic Area	Type of District	Minority Population	SES
Thinkings kills 1	10th	West	Suburban	20%	Middle to low
Thinking skills 2	6-8	Southern west coast	Suburban	56%	Middle
Thinking skills 3	11th	Southeast	Urban	27%	Middle to low
Math 1	9-11	West	Suburban	low	High to middle
Math 2	9-12	Pacific northwest	Urban	25%	Middle to low
Math 3	9-11	Midwest	Urban	low	Middle to low
Science 1	9-11	Southern west coast	Suburban	–	Middle to low
Science 2	6-8	Southern east coast	Combination of all 3	50%	Middle to low
Science 3	6-8	Midwest	Rural to urban	52%	Middle to low

Data Collection

Although each case study was conducted by a different researcher, the data collection process across the nine case study sites was similar. This commonality of approach was reinforced by periodic meetings of the researchers during the research period to discuss data collection and analysis issues. In general, data were gathered primarily in the form of 1) classroom observations, 2) interviews with students, teachers, administrators and other key personnel, and 3) documents from the reform sites.

Classroom observations. Classroom observations at all sites generally focused on behaviors, interactions, and conversations of both students and teachers. These data reflected key information about 1) the reform effort as it played out in the classroom setting, 2) student learning, 3) teacher learning and teaching, and 4) assessment. Different sites offered opportunities for more or less scrutiny of each of these aspects of the reform. In some sites classroom interactions, such as presentations and group work were audio- and/or video-taped for future analysis. In some sites hallways were settings for informal discussions with teachers and/or students. One set of "classroom" observations even included a trip to the off-campus site where the class convened. For the most part, classroom observations were the most uniform in practice across the nine sites. For efficiency and clarity, however, several case studies focused on a few teachers rather than all the teachers implementing the reform.

Interviews. Universally both students and teachers were interviewed to elicit their perspectives about the reform and its impact on them as participants in it. In most cases, building level administrators were also interviewed to provide a school level view of the reform. Where appropriate, other school administrators, district administrators, program developers and university support personnel and trainers were interviewed to provide a wider perspective of the change process on the teachers, students, and other impacted groups and to gain an understanding of the overall context for the reform.

The number of students and teachers interviewed was site specific and dependent upon the framework of the case and its level of focus within the reform. Generally an effort was made for equal representation across gender, academic achievement, race/ethnicity and tenure within the reform. At one site a cadre of 15 students was chosen by teachers to fit the research criteria matrix of academic needs and potential with modes of expression--specifically written, oral or artistic--for both samples of student work and interviews. In a number of instances, students from the previous year's program were interviewed to provide a sager viewpoint of the reform. Those teachers whose classrooms were observed most often, also were interviewed more extensively than other teachers.

Document collection. While the distinctive character of each reform site generated a unique set of documents necessary to describe the nature and process of each reform, many similar types of documents were collected at most sites. These documents included curricular materials, student work, and contextual information. Curricular materials demonstrated the individual character of the reform and teacher role. Student work represented examples of both student

learning and assessment formats. Contextual information was usually collected in the form of documents from building, district or state levels, and provided insight into specific characteristics of the reform and levels of support within the system for the reform efforts.

Expanded access to reform efforts and/or participants. The context of reform at a few sites required some researchers to expand the circle of informants. Former faculty members associated with locally developed reforms were interviewed at two sites to provide history and perspective on the reform. Researchers sat in on teacher planning meetings, faculty meetings, inservice training, parent meetings, meetings with visitors, and/or regional conferences.

Two researchers played participant observer roles. One researcher became part of the teaching team, sharing planning sessions and working with students. The other served as a knowledgeable assistant to the teacher, answering students' questions and facilitating their thought processes through questioning techniques to elicit student thinking.

Unique documentation. A broad range of unique documents were gathered at many sites to facilitate understanding of the reform and its context. At the thinking skills sites mission statements and philosophies demonstrated the way in which the reform was embedded in the larger context of the school. Teacher awareness of the personal nature of the change process, at one site, provided a journal documenting personal development within the reform effort.

Each individual case study highlights its data collection process and the unique activities or documents associated with the development of that case. For specific data collection information see the report of the particular case study.

Data Analysis

Data analysis took part in two phases: the individual analysis for each of the nine case studies and a cross-site analysis across the nine case studies.

Nine case studies. In analyzing their data, the case study researchers generally followed the analytical methodology of Spradley (1979). These steps include domain analysis constructed from each data source and taxonomic analysis used to derive prominent themes about the site. Particular descriptions and direct quotation of informants set the tone and paint the picture of the site. Diagrams and interpretative commentary provide explanations and connections within the analysis. Some researchers developed vignettes to convey perceptions of informants and to give a real sense of the critical incidents and interactions at the sites. Through these methodologies, an attempt was made to provide a comprehensive, objective account.

Cross site analysis. The actual cross-site analysis process itself included the following eight phases (after Rossman, 1992), the first two of which were completed in the process of defining and conducting the nine case studies.

Phase 1: Beginning. This phase entails locating the areas of interest that will provide the focus of the cross-site analysis.

Phase 2: Bounding the scope. "This phase places initial boundaries on the scope of the synthesis."

Phase 3: Inventorying the cases. This phase requires describing the following:

> Focus. Describe the focus such as "the curriculum itself, implementation strategies, instructional practices, student outcomes, professional development, the culture of the classroom, professional associations or state agencies. The researcher should identify the primary focus of each case study and list it, perhaps in a matrix to facilitate comparison among the cases."
>
> Goals. Identify and list each study's goals to help "the researcher understand the study's implications and potential parallels with others."
>
> Scope. Identify the level of analytic interest, e.g., individual or nation, as well as the intensity of data collection and its duration.
>
> Complexity. Identify the complexity, e.g., the number of classrooms involved and the mix of research methods.
>
> Organization. Is the case organized "temporally, thematically, by individuals (students, teachers), or by some other means. These structures are part of the conceptual framework of the study and shape the conclusions presented."
>
> Audience. Who is the audience for the report?

Phase 4: Reading the cases. "This phase entails immersion in the cases--repeated reading and reflecting on the texts."

Phase 5: Developing an interpretation of each case. "After immersion in the set of cases under consideration, the researcher focuses on each case in turn to identify the key metaphors that illustrate the central meaning(s) of the cases. This may be driven by a conceptual framework constructed prior to beginning the syntheses (always held tentatively, however) or may be more purely inductive ... lists of metaphors, concepts, and themes as expressed in phrases or vignettes are useful to construct. These represent the interpretations of the cases. The challenge here is to develop interpretations sufficiently general to be comparable to the other cases yet grounded in the details of the specific case."

Phase 6: Juxtaposing the cases. "Here analogic reasoning comes to the forefront as the researcher compares and contrasts the various interpretations. One case is like another in what

ways? different? extends and elaborates? How do the central metaphors relate to one another both within the cases and across cases? Which metaphors provide the most explanatory power to capture the essences of the cases? Which metaphors most cogently, elegantly, and economically describe the set of cases? This process entails comparing themes, metaphors, and explanatory stories across cases. During this phase, it is likely that comparing the interpretations will lead to new insights into the cases--a reconceptualization of the entire work. Here, as in Phase 2, the use of matrices can enliven the process."

Phase 7: Synthesizing the cases. "'We are no longer dealing just with observables [cases] but also with unobservables [interpretations], and are connecting the two with successive layers of inferential glue.' This 'inferential glue' is the stuff of synthesis, a grounded theory of the subject that tells us something new while preserving the sometimes contradictory specifics of the cases."

Phase 8: Writing the synthesis. "This final phase entails writing the synthesis which should be true to the original purpose of the work, crisp in style, loyal to the details of the cases, but provide a more complex understanding of the subject than does any single case." (Rossman, 1992)

Systemic perspective. A major theme of this analysis was the interconnectedness of the many components. The conceptual framework for the cross-site analysis was based on a 9 cell matrix, but the analysis was not limited to these categories; interactions across these cells were explored. Maintaining a systemic perspective was essential and models based on the work of Senge were examined for this reason.

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